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REMARKS

Reconsideration of the application is respectfully requested in view of the following responsive remarks. For the Examiner's convenience and reference, Applicant's remarks are presented in the order in which the corresponding issues were raised in the Office Action.

In the Office Action of October 9, 2007, claims 1-22 were rejected under 35 U.S.C. § 103 (a) as being unpatentable over U.S. Pat. No. 6,203,899 (hereinafter "Hirose") in view of U.S. Pat. No. 5,372,884 (hereinafter "Abe") and U.S. Pat. No. 3,007,878 (hereinafter "Alexander"), further in view of U.S. Pat. No. 5,965,252 (hereinafter "Santo").

It is respectfully submitted that the presently pending claims be allowed based on the remarks below.

Rejections Under 35 U.S.C. § 103

The Examiner has rejected claims 1-22 U.S.C. § 103(a) as being unpatentable over several references. Emphasis on the independent claims is provided herein, as the Applicant asserts that these claims are all patentably distinct over the prior art. Specifically, the Examiner has rejected claims 1-22 as being obvious in view of Hirose, Abe, Alexander, and Santo. Thus, a brief discussion of these references is believed to be in order.

Hirose

Hirose discloses a printing medium containing a liquid-absorbent base material; an ink-receiving layer consisting of a pigment, a binder, and a cationic substance; and a surface layer consisting of cationic ultrafine particles. Hirose exemplifies the ultrafine particles as two distinct and alternative species: first, as "silica subjected to a surface treatment with a compound containing some of the cationic metal oxides or metal atoms as described above," which were "magnesium, calcium, aluminum, zinc, chromium, iron, copper, tin, lead, and manganese," and second, as "silica subjected to a surface treatment with an organic compound having both amino group or quaternary ammonium group thereof and functional group having reactivity to a silanol group on the surface of the silica." See col. 4, lines 18-25. The Examiner also states that the cationized silica is formed either by treating it with a metal oxide or by treating it with organic compound having both an amino or quaternary

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ammonium group and a functional group. See February 6, 2006 Office Action, page 5; September 21, 2006 Office Action, page 3; and June 21, 2007 Office Action, page 3.

Abe

Abe discloses an ink-jet recording sheet comprising a support and ink receiving layer wherein the ink receiving layer contains a cation-modified non-spherical colloidal silica. The silica is cation-modified by coating the silica with a hydrous metal oxide such as hydrous aluminum oxide, hydrous zirconium oxide, or hydrous tin oxide as carried out by the methods in Alexander. See col. 2, lines 48-58. The Examiner describes Abe in the same fashion. See February 6, 2006 Office Action, page 5; September 21, 2006 Office Action, page 4; and June 21, 2007 Office Action, page 4.

Alexander

Alexander discloses the methods of making positively charged particles of dense silica by mixing them with a basic salt of a metal having a valence of 3 to 4, such as basic aluminum chloride. See col. 1, lines 11-16; col. 2, lines 21-26; col. 4, lines 9-11. The Examiner also states the Alexander teaches the "forming [of] a stable aquasol of positively charged coated silica particles." See February 6, 2006 Office Action page 5, last paragraph; September 21, 2006 Office Action, page 4; and June 21, 2007 Office Action, page 4, 5.

Santo

Santo discloses a printing medium comprising a substrate and an ink receiving layer. The ink receiving layer comprises an alumina hydrate surface-treated with a coupling agent. See Abstract. The coupling agent is preferably a silane coupling agent. See col. 7, lines 22-24. The Examiner also states that Santo teaches "an alumina hydrate surface-treated in an aqueous dispersion with a silane coupling agent . . ." See February 6, 2006 Office Action, page 7; September 21, 2006 Office Action, page 4; and June 21, 2007 Office Action, page 4.

Discussion

The Examiner has rejected claims 1-22 using a combination of the aforementioned four references; Hirose, Abe, Alexander, and Santo. Each claim is directed to a method that requires at least three specific steps. First, the silica is dispersed in water. Second, the silica's negative charge is reversed by a surface-activating agent forming a surface-activated

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silica. Third, the surface-activated silica is then reacted further with an organosilane reagent to form a reagent-modified and surface-activated silica. Dependent claims 2-4 vary the order of the first two steps of the method, but the reagent-modifying step is always performed such that the organosilane reagent is attached to the surface-activated silica. This requires that the surface-activated silica exist before or as the organosilane reagent is attached.

The rejection based on the combination of Hirose, Santo, Abe and Alexander fails to teach each and every element of the present invention. Specifically, the combination of references fails to teach at least (a) modifying a pre-modified silica particle, (b) cationizing a surface of silica and modifying the silica with organosilane reagent, and (c) the organosilane reagents contacting surface-activated silica particulates.

The combination of references fails to teach modifying a pre-modified silica particle

None of the cited references teach the present process, nor do they teach modifying a pre-modified silica particle. The present invention modifies silica by reversing the net charge by using a surface activating agent and also further modifies the surface-activated silica particulates by contacting them with organosilane reagents to form reagent-modified and surface-activated silica particulates. All of the references cited are directed towards surface modification by traditional methods.

The Examiner has combined three silica references with an alumina reference. Hirose, Abe, and Alexander are silica references, each referring to silica particles and specifically teaching silica surface treatment. None of Hirose, Abe, or Alexander teaches further modification of the treated silica particle. Santo is directed to alumina particles and does not discuss surface treatment of silica particles, let alone modifying silica particles twice.

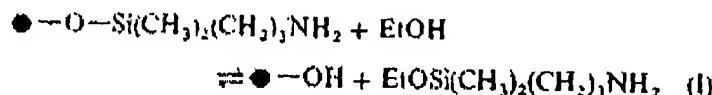
The Examiner has compared the alumina hydrate of Santo to the coated silica of Hirose, Abe, and Alexander. However, as discussed at length in previous responses (see Response dated September 6, 2007, August 22, 2006; Response dated December 21, 2006; and Response dated May 17, 2007), such a comparison is improper. Hirose teaches similar chemistry to Santo; the difference being one is a silica particle and the other is an alumina particle. The Examiner, in an attempt to combine the references to meet the presently pending claims, has compared an aluminum hydrate used to form a surface activated silica particulate (i.e. a coating) to an alumina hydrate particle. Therefore, Hirose, Abe, and

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Alexander can be viewed as being directed to activating a silica particle with a surface activating agent, and Santo is directed to surface-treating alumina hydrate particles.

The actual surface chemistry consists of oxygen on the surface of the particle bonding to the silicon atom as the ethoxy group leaves as represented in the following reaction scheme (I):



Where \bullet represents the silica

At best, Hirose in view of Abe/Alexander would be a partially covered silica particle surface-activated by basic aluminum chloride in an aqueous environment while the surface of Santo would teach a similarly modified alumina particle. These surfaces are not the same. Contrary to the Examiner's prior assertions, the alumina hydrate disclosed in Santo is not the same basic aluminum chloride disclosed in Alexander; this point is discussed in detail below. Regardless of the alumina issue, neither separately nor in combination do the references teach modifying a pre-modified silica particle. The Examiner has further stated that Santo demonstrates the advantages of the sequence of steps claimed by Applicant. Once again, Applicant asserts that this is not true, in that Santo does not represent any of the steps in the present claims. Santo teaches organosilane modification of the surface of an alumina particle, while the present claims recite organosilanes contacting the cationized surface of silica particles.

The combination of references fails to teach the element of cationizing the surface of silica and modifying silica with organosilane reagent

By the Examiner's own admission, Hirose "fails to teach that (i) colloidal silica particles are treated first with alumina or alumina hydrate so that a negative charge on its face changes to a positive charge forming cationized silica then the cationized silica having on its surface alumina or alumina hydrate is contacted with the organosilane reagent to form organosilane modified cationized silica; (ii) colloidal silica particles are treated with the cationic alumina and alumina hydrate by dispersing silica particles in an aqueous environment to form an aqueous dispersion." See September 21, 2006 Office Action, page 3; see also June 21, 2007 Office Action, page 3. Santo fails to teach cationizing the surface of

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silica. Therefore, neither teaches the element of cationizing the surface of silica and modifying silica with organosilane reagent.

The Examiner has asserted that the claimed sequence is *prima facie* obvious.

However, the Examiner has shown no support for the truth of such an assertion as applied to the present invention. As the Applicant has pointed out before, methods are unique in that finding one claim aspect or step here, and another there does not, in and of itself, necessarily disclose the method to one of ordinary skill in the art. This is particularly true with chemical methods or processes, wherein the steps are often inter-related. With organic chemical reactions, it is notable that the starting materials are to be compatible with the reaction scheme. Varying starting material or solvents can have negative effects on the resulting product in any given scheme. Applicant has cited one example of this principle, i.e. Grignard reactions, where disregarding the proper protocol can yield disastrous results. See, e.g. Response dated September 6, 2007. Similarly, in the present reaction method, though not dangerous, a failure to perform this precise method could result in mixing the functional groups of the organosilane reagents with metal oxides or aluminum hydrates, which may not be compatible. Further and more importantly, failure to perform the precise method may not lead to the reagent-modified and surface-activated silica particulates as required by the present claims.

The Examiner has argued that "a proper sequence of adding ingredients to obtain the most satisfactory mixture is within a skill of a person of ordinary skill in the art, and such a choice does not involve invention." See June 21, 2007 Office Action, page 3. However, such a statement assumes that a reference or combination of references provides all of the steps. That is not the case here, where none of the references provides all the present steps of independent claim 1 or 15 regardless of order, as further explained below and in the next section. Additionally, the Examiner has combined four references to provide the instant rejection, but has not provided any apparent reason that a person skilled in the art would modify the individual teachings of these four references and combine them in the presently disclosed order to achieve the present reaction scheme. Furthermore, the Applicant contends that even an attempt to modify the references based on the teachings of the references would still fail to disclose each and every element of the present claim set.

Specifically, the Applicant contends that the present steps outlined in the independent claims are not arbitrary and require one specific sequence in order to arrive at the present invention. Although the Examiner has alleged that such a sequence is obvious; see June 21,

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2007 Office Action, page 7; such is not the case. Furthermore, it is not obvious to combine the two distinct treatments disclosed in Hirose based on the teachings of Hirose, let alone modify the disclosure of Hirose to sequence them. To be clear, Hirose teaches that silica can be treated with a metal oxide or treated with organic compound having both an amino or quaternary ammonium group and a functional group, as noted by the Examiner throughout this prosecution. See, e.g., February 6, 2006 Office Action, page 5; September 21, 2006 Office Action, page 3; and June 21, 2007 Office Action, page 3. As such, Hirose teaches that these steps provide the same purpose, i.e., obtaining cationized silica, and therefore, Hirose effectively teaches away from combining these two distinct steps. In other words, since Hirose teaches that either step can be used, there is no apparent reason one skilled in the art would perform both steps.

As the Applicant has raised the issue of teaching away, the Applicant would like to review the current case law regarding teaching away for the Examiner's convenience. The Court of Appeals for the Federal Circuit has clearly stated that "an applicant may rebut a *prima facie* case of obviousness by showing that the prior art teaches away from the claimed invention in any material respect." *In re Petersen*, 315 F.3d 1325, 1331 (Fed. Cir. 2003). The Court has also stated that "[w]e have noted elsewhere, as a 'useful general rule,' that references that teach away cannot serve to create a *prima facie* case of obviousness." (emphasis added) *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1354 (Fed. Cir. 2001).

As previously noted, none of the references teach the element of cationizing the surface of the silica and modifying the surface-activated silica particulates with organosilane reagent. The Examiner has included the combination of Hirose, Abe, and Alexander to teach cationizing the surface of silica. Santo has been included in an attempt to remedy the deficiency in teaching contacting the surface-activated silica particulates with organosilane reagents. It is the Applicant's position that Santo does not teach contacting the surface-activated silica particulates with an organosilane reagent, however, assuming *arguendo* that Santo did teach this element, it does not teach cationizing the surface of silica. On the other hand, the combination of Hirose, Abe, and Alexander does not teach contacting the surface-activated silica particulates with organosilane reagents. In other words, the step of contacting the surface activated silica particles with an organosilane reagent cannot be present in any of the references, because none of the references teach both types of treatment, and thus, this interconnection of steps cannot be taught by the cited references.

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Further, the present claims are directed to methods, and as such, finding one claim aspect or step here, and another there does not, in and of itself, necessarily disclose the method to one of ordinary skill in the art. In the present case, the Examiner has allegedly identified one aspect of the method in a combination of three references, and allegedly identified another aspect in still a different reference. Both the reversing the net charge of the surface of the silica particulates and the contacting the surface-activated silica particulates with organosilane reagents are necessary to produce reagent-modified and surface-activated silica particulates. The cited references do not teach the required claim element of cationizing the surface of the silica and then modifying the surface-activated silica particulates with organosilane reagent. No reference teaches modifying surface-activated silica with an organosilane reagent. Given that as a general principle of organic chemistry proper reaction sequence is important and often critical, and that the references cited by the Examiner do not teach or suggest the claimed collocation of steps or their claimed sequence, Applicant asserts that there is no *prima facie* case for obviousness of the present claims.

The combination of references fails to teach organosilane reagents contacting surface-activated silica particulates

The combination of references cited by the Examiner fails to teach organosilane reagents contacting surface-activated silica *particulates* to form *reagent-modified and surface-activated silica particulates*. Hirose, Abe and Alexander are silica references. Each refers to silica particles and specifically teaches silica surface activation. Santo, on the other hand, is directed to alumina particles and not to coatings. Santo teaches alumina particle surface activation. The Examiner continues to rely on alumina hydrate particles of Santo and alumina hydrate coated particles of Hirose being the same. They are clearly not.

As previously argued in past office action responses, Santo teaches a surface-activated alumina hydrate. To be clear, alumina hydrate is not the aluminum chloride hydrate as found in the Applicant's disclosure. Alumina and aluminum are distinct in this context; the first referring to a particle and the later referring to an individual atom which is part of a chemical molecule. Specifically, in Santo, alumina is a particle having "pore properties" "within a range of from 0.1 to 1.0 ml/g" and a "specific surface area" "of from 40 to 500 m²/g." See col. 4, lines 15, 19-21, 25-26. The surface of the alumina can be modified to have Al-O, Al-OH, or Al-H as well as an Al-silane coupling agent. See col. 3, lines 60-65; col. 4, lines 39-

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43. Therefore, the alumina activated surface of Santo and the silica activated surface of Hirose, Abe, and Alexander are similar in at least one way, in that they both include particles that have chemicals attached thereto. The aluminum chloride hydrate of the present invention is more of a chemical coating, whereas the alumina hydrate of Santo is a particle.

The present invention is directed to a method that includes an organosilane reagent attaching to the surface-activated silica, which requires that the surface-activated silica exist before or as the organosilane reagent is attached. The surface activating agent, aluminum chloride in the above discussion, serves more of a coating in the present invention, and is therefore distinct from the alumina chloride of Santo.

Therefore, the Applicant submits that the Examiner has failed to present a *prima facie* case of obviousness for lack of teaching all the claim limitations in the instant application. Specifically, the combination of references fails to teach (a) modifying a pre-modified silica particle, (b) cationizing surface of silica and modifying silica with organosilane reagent, and (c) organosilane reagents contacting surface-activated silica particulates, all taught and required by the present claims. As such, Applicant respectfully requests that the Examiner withdraw the rejection and allow of the claims.

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CONCLUSION

In view of the foregoing, Applicants submit that claims 1-22 present allowable subject matter and allowance is respectfully requested. If any impediment to the allowance of those claims remains after consideration of the above remarks, and such impediment could be removed during a telephone interview, the Examiner is invited to telephone the undersigned attorney at (801) 566-6633 so that such issues may be resolved as expeditiously as possible.

Please charge any additional fees except for Issue Fee or credit any overpayment to Deposit Account No. 08-2025.

Dated this 7th day of December, 2007.

Respectfully submitted,



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